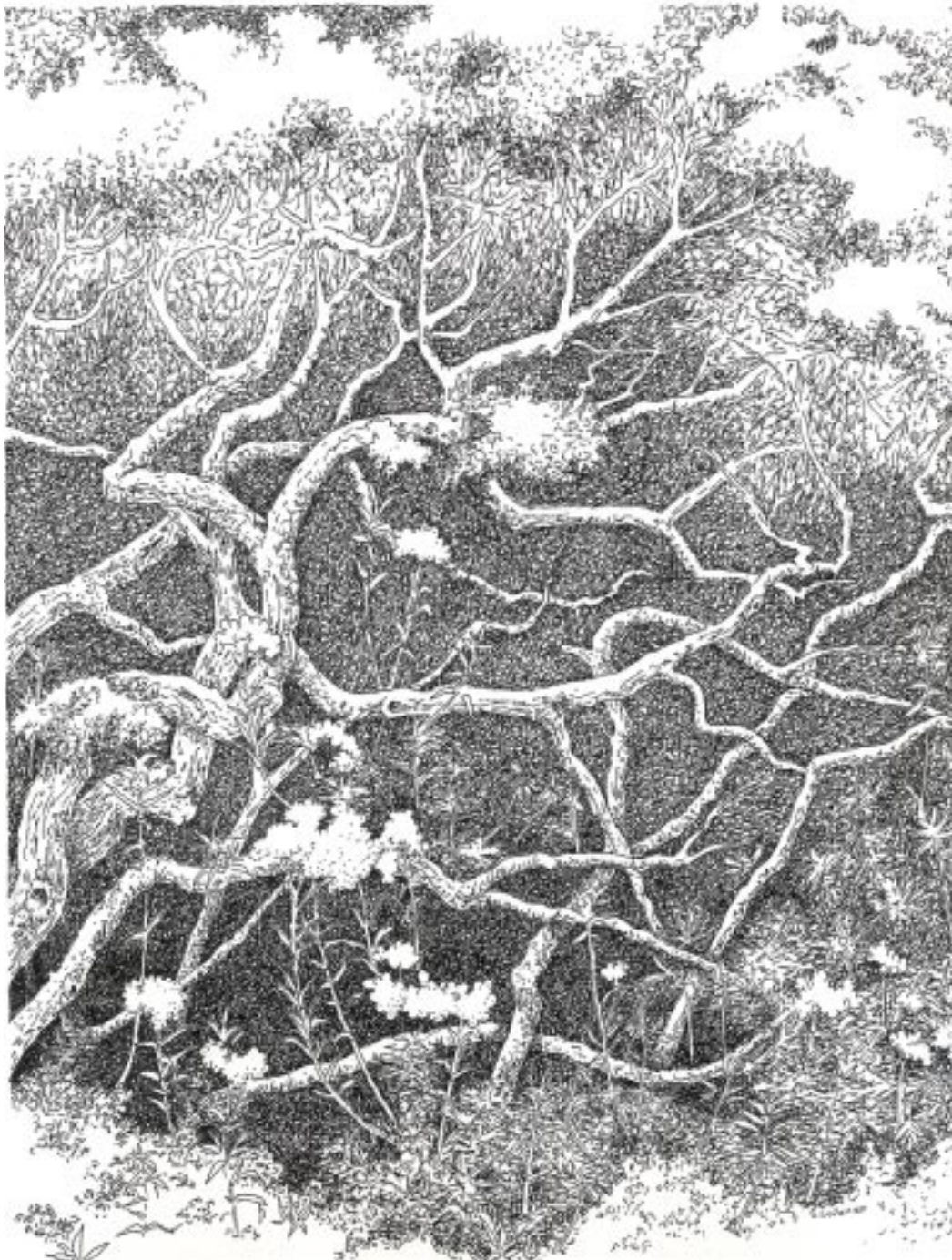


SECTION 6

GROWING FROM CUTTINGS



GROWING FROM CUTTINGS

In the wonderful world of plants, we can grow a complete plant from only a small piece! Whenever we can, we use seeds for our projects to maintain the greatest genetic diversity possible. But if seeds are unavailable or we haven't found the secret to making them germinate, we use plant cuttings. We take cuttings from as many plants as possible, again, to maximize genetic diversity.

How does a piece of a stem turn into a new plant? There are **meristematic** (undifferentiated) cells just under the bark or skin (**epidermis**) of the stem, and undifferentiated cells at the buds. These cells haven't decided what part they want to be. By applying hormones to the bottom of a cutting, we can induce those undifferentiated cells to turn into roots. Plants make hormones for flowering and seed formation, a hormone for leaf drops in the fall, and a hormone for rooting. The rooting hormones have been duplicated in the lab and we can buy them in different concentrations.

A weak hormone (Rootone, Hormex #1, Dip and Grow at a 1:20 dilution) is used on green soft wood. Stronger concentrations are used on more woody stems. We usually take **hardwood** cuttings in the winter, using **dormant wood**. From late spring to mid-summer, we do cuttings using the current year's growth, which is a little woody but still bendable (**semi-hardwood cuttings**).

Ideally, we take cuttings in the morning, when they contain the most water. We keep them moist and cut into the appropriate-size pieces. We clean them in a dilute bleach solution, then treat them with the hormone and stick them in a flat with a very light, well-drained mix of perlite and vermiculite. At Oceana, the only plants we grow from cuttings are strawberry plants. They root readily, which means that we do not have to use rooting hormones. For more information about hardwood and semi-hardwood cuttings, see page 64.

6.1 MAKING THE CUTTING MIX

Perlite and **vermiculite** work well as growing media. Perlite is mined from natural lava flows, crushed, and screened to a uniform size. It is then put in a furnace at 1400°F (760°C). The small amount of moisture in the rock changes to steam and expands the particles, like popping popcorn. This leaves microscopic holes that provide air in the rooting medium (and for the base of the cutting, which retards rotting). Perlite can hold three to four times its weight in water, but does not contain any nutrients.

Vermiculite is related to mica. Mined in Montana and North Carolina, it looks like mica, but when it is heated to 2000°F (1090°C), the water trapped between the layers turns to steam and expands the layers to create a spongy porous kernel. It has charged sites (**high-cation exchange capacity**—ask your chemistry teacher) that will hold nutrients to be released to the plant as it grows. Vermiculite provides calcium and magnesium to the plant and holds water in its layers.

Perlite and vermiculite are both sterile and will not transmit any diseases to the plants unless they are contaminated in handling. The normal ratio for a good flat mix is 3 parts perlite to 1 part vermiculite.

Supplies

Hose

Dilute bleach water (1/2 teaspoon per gallon of water; wear safety glasses when mixing the bleach water and dipping cuttings)

Wheelbarrow, large tray, or tub

Shovel or scoop (You can make a scoop out of a bleach bottle or commercial cleaner gallon bottle, which is usually heavier duty; cut to shape, keeping the handle intact. About 4 1/2 of these scoops

fills one regular flat.)

Perlite

Vermiculite

Dust mask

Goggles

Nutricote (for strawberry cuttings)

Procedure

■ Wash off mixing tub and shovel or scoop with water; then sterilize with bleach solution.

■ Wearing a dust mask, put 3 scoops of perlite in tub. Spray with water to cut down on dust.

■ Add one scoop of vermiculite (**don't wet this**, as water tends to compact the layers in the particles and it will lose its desirable properties).

■ Repeat until you have enough mix for the project.

■ Add 1/4 cup Nutricote per flat, or 2 cups Nutricote per wheelbarrow if mix is for strawberries.

■ Clean up.

6.2 FILLING FLATS WITH CUTTING MIX

Supplies

Flats

Scoop

Cutting mix in clean bin

Leveling edge (at least 20 inches long)

Dust mask

Bleach and hose with fan head

Procedure

■ Wash hands; sterilize supplies.

■ Check to see if perlite/vermiculite mix in storage bin is moist. If it's dry, wear a dust mask and spray mix with just enough water to moisten.

■ Scoop mix into flat so it is mounded higher than the top of the flat.

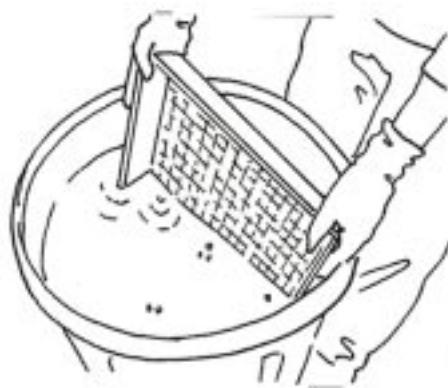


Figure 6.1 Washing and filling a flat

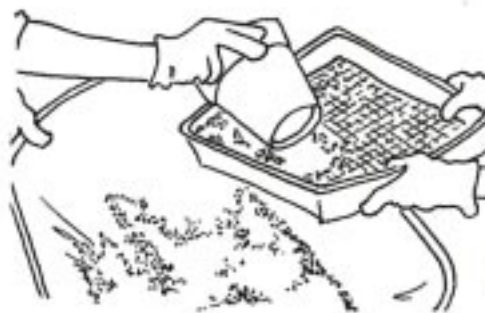


Figure 6.2 Runners trimmed in the field



Figure 6.3 Runners cut into individual plantlets



Figure 6.4 Plantlet ready to stick in flat



Figure 6.5 Flat filled with plantlets

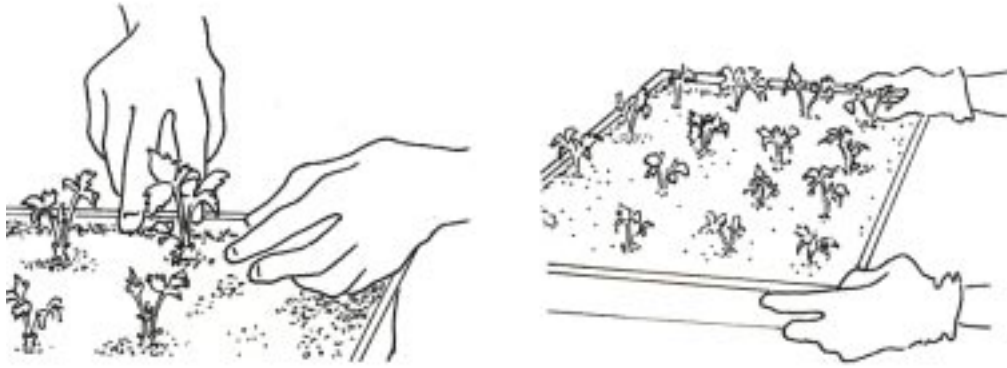


Figure 6.6 Sticking plantlets in flat ready to be labelled. Then take flat to mist house

- Smooth mix out to edges of the flat until it is even with the top of the flat.
- Add or remove mix, as needed. Discard any mix that falls on table or floor.
- Use leveling edge to zigzag across flat so surface is very level; fill in where light shows under edge of leveler. Put the extra mix that piles up in front of leveler back into bin.
- Put on cart or table outside. Water in gently with fan head. Let flats drain while cuttings are being obtained from the field.
- Clean up.

6.3 STRAWBERRY CUTTINGS

Strawberries grow by sending out **stolons** (above-ground runners) from the main plant. Once the runner is far enough from the mother plant to have room to grow, it produces a plantlet and begins rooting. Strawberries have pre-formed, or **latent, root initials** at the base of each plantlet. Since this is their normal method of propagation, the strawberry plant has evolved to root readily from these plantlets. They root quickly because the meristematic tissue at the base of the plantlet develops

into the initial root cells as the plantlet develops. Once the plantlet is cut from the stolon, all it needs is contact with a growing medium and moisture. The latent root initials are then stimulated to grow into roots.

Cuttings need very clean, light media (fungus is the big enemy), 100 percent humidity (to compensate for the lack of roots), moisture around the base of the cutting, air around the base of the cutting (to prevent fungus), low light (to cut down on water need), and a medium that will physically support the cuttings.

To collect cuttings, take a group to Milagra to gather strawberry runners. Each person should have a pair of shears and a white plastic grocery bag to carry the cuttings in so they don't wilt (use rubbing alcohol to sterilize shears between uses). Each collector keeps track of approximately how many plantlets (s)he collects so the leader can determine when the group has met its collection goal. Collect from a variety of habitats, removing only a few runners from each area. All material collected should be disease- and insect-free. When collection goal has been met, return to the nursery.

Supplies

Prepared flats (filled with flat mix, leveled,

and watered)

Dilute bleach water (1/2 teaspoon bleach per gallon of water) in a clean bowl or basin

Colanders

Lath (or other straight edge) just under 16 inches long

Procedure

- Cut the runners into individual plantlets, using shears. Leave about 1 inch of runner on either side of each plantlet; discard the remaining runner.

- Place plantlets in colanders.

- Sterilize by submerging the colanders full of plantlets in the dilute bleach water for about 30 seconds.

- Set up one prepared flat for every fifteen strawberry cuttings.

- Mark each flat with five rows, using a straight edge. Each plantlet needs about 3 square inches to grow. The flats are 16 inches x 16 inches. Therefore, five rows of plantlets with five in each row, or fifteen strawberries per flat, will give plenty of room for each plant to develop.

- Place the plantlets into the flat. It's easiest to stick them in by holding one end of the runner and poking the other end into the flat mix.

- Be sure that each plantlet is in good contact with the rooting medium. The root initials will not develop if in contact with the air.

- Label flats and record data on propagation forms.

- Place completed flats in the greenhouse and gently water until water comes out from the bottom of the flat.

- Be sure the mist system is set to provide frequent misting until roots have formed.

- Transplant each rooted strawberry to a 4-inch pot and place outside to mature.

6.4 AFTERCARE OF CUTTINGS

After flats of cuttings are taken to the greenhouse, they should be watered in with a fan-head nozzle. Run the water between each row of cuttings. This settles the soil in around the roots and fills any holes around the roots. Every two or three days, the cuttings should be checked for signs of infection. If infected, leaves will usually be dull-colored and possibly starting to wilt. If leaves appear wilted even though the flat is moist, or if leaves or stems are a dull brown or black, pull the cutting and check stem for black areas (root rot). If evidence is seen, the cutting should be disposed of and cuttings sur-



Figure 6.7 Strawberry plant

rounding it should be carefully checked.

Moisture level in the cutting flat is critical. *Phytophthora* sp. (root rot) spreads only in a saturated medium. Media should feel moist but not wet when rubbed between the thumb and fingers. Flat should be light enough to easily picked up (not over 5 pounds).

Mist only the leaf surface; it should not run long enough to drip onto the media. Check the flats' weight each day to see if they need extra water.

Watering nozzles must be kept off the floor. There are fungal spores in the soil and in dust or dirt on the ground. The nozzle will pick them up and spread them to the cutting with the irrigation water.

When roots begin to show through the bottom of the flat, stop misting. This hardens off the cuttings and encourages roots to grow deeply into the medium.

After a week or so, cuttings can be transplanted to the appropriate-size pots. If transplanting is delayed, sprinkle about 1 tablespoon Nutricote over the flat (if Nutricote was not added in original flat mix), as there are no nutrients in the perlite/vermiculite media.

6.5 TRANSPLANTING CUTTINGS

Supplies

Clean pots, half-filled with potting mix and watered

- Lukes or tubes for herbaceous upright plants
- 4-inch pots for spreading herbaceous plants (including strawberries)

- Lukes for slow-growing shrubs
- Vaders for fast-growing shrubs or trees

Potting mix, moist but not wet

Flats of rooted cuttings to be transplanted

Fork in each flat of cuttings

Small tray to hold eight to ten cuttings

Labels

Nursery markers or pencils

Propagation and Transplant Records

Procedure

- For the sake of the plants, work in the shade.
- Clean the bench with dilute bleach water.
- Put rack or flat of partially filled pots on the bench on one side of you.*
- Put cutting flat on the bench on the other side.
- Put soil in front of you if it's in a pan, or next to you on the ground if it's in a bin or wheelbarrow.
- Insert fork or fingers into flat, at least 1 inch away from any stem. Dig to the bottom of the flat and gently ease out eight to ten cuttings. Don't remove too many, the roots will quickly dry out and die from prolonged contact with air or direct sun.
- Put cuttings on a small tray.
- With one hand, hold a rooted cutting up in a pot. Remove some soil from the pot if necessary so roots are not bent in the bottom.
- With the other hand, scoop up some soil to pour around the roots.
- Continue until pot is filled to the top.
- Give the pot a tap on the bench to settle soil around the roots.
- Put in flat.
- When rack is filled, tap it on the bench to settle all the pots.
- Label the flat or rack; put a label in two opposite corners and include transplanting date.
- Put racks or flats of pots on a cart and water, using a fan-head nozzle on the

end of the hose (no wand).

- When the cart is filled, bring plants into greenhouse.

- Check to be sure pots are well-watered. Water again, if needed.

- Record work accomplished in Propagation and Transplant Records.

*If working with lukes, start on the side of the rack farthest from you, and follow the same procedure.